



Analyze Data from iPhone

Rocket Flights

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TOOLS:

- [Computer running Windows XP, Vista, or Mac OS X \(1\)](#)
- [iPhone, iPad or iPod touch \(1\)](#)
- [iTunes \(1\)](#)
- [techBASIC \(1\)](#)

SUMMARY

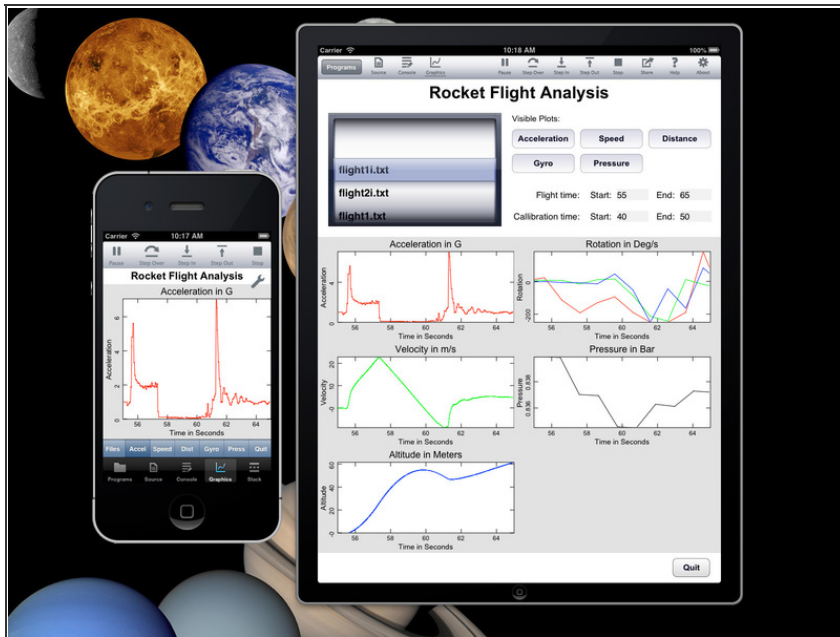
This project walks you through the steps to download and install a program to analyze rocket data collected from flying a SensorTag on a model rocket. You'll find out the G forces on the rocket, how fast it went, how high it went, and see the rotation and air pressure during the flight.

Here's a [link to the Maker project](#) to build the ST-2 rocket that carried the iPhone in the movie. Build this rocket to collect your own data to analyze following the steps in this project.

You don't need to know how to program to follow this project. You get the complete source code, though, so if you do know a little programming, you can tinker with the analysis

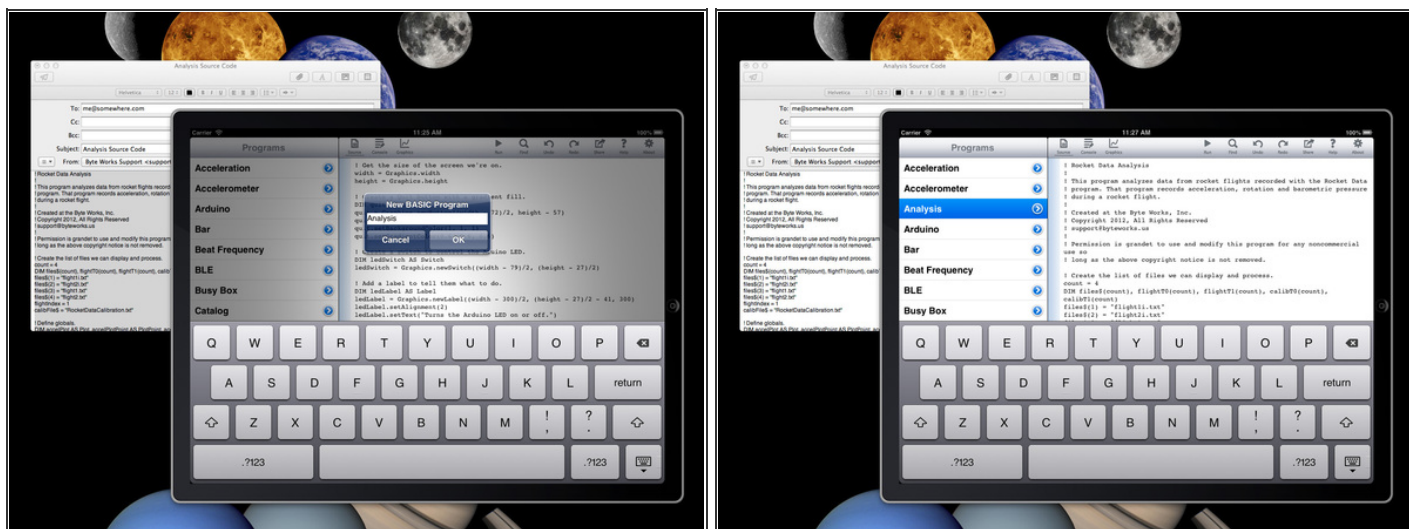
program to learn even more.

Step 1 — Analyze Data from iPhone Rocket Flights



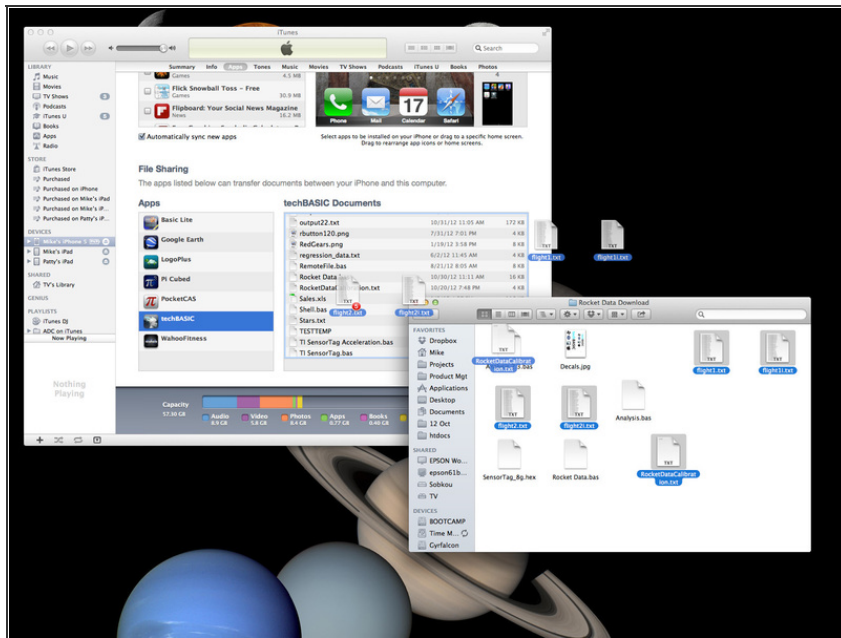
- Download the software and our sample files from [here](#).
- If your O/S doesn't do it automatically, unpack the zip file.
- The software will work on both the iPhone and iPad.

Step 2



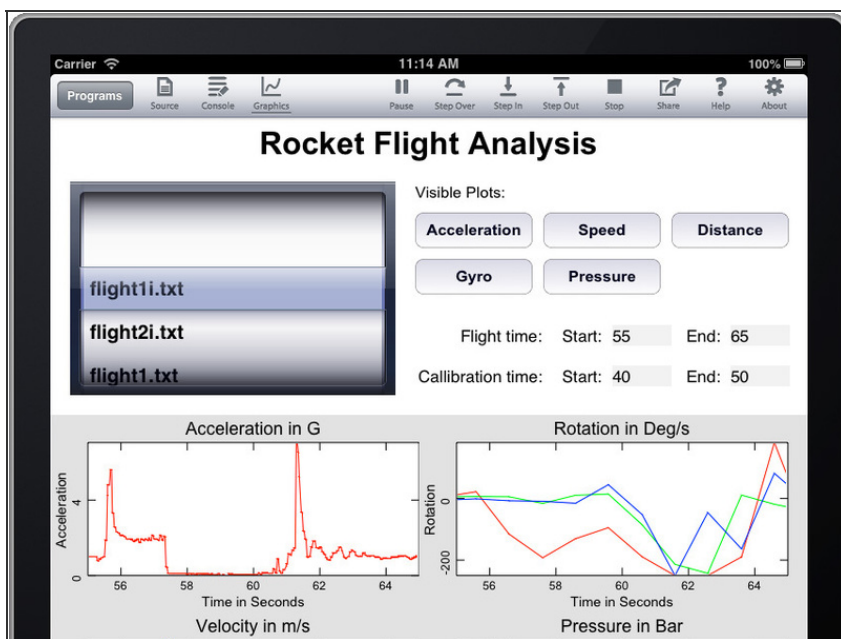
- Copy the contents of the file `Analysis.bas` and paste it into an otherwise empty email. Mail this to yourself.
- If you are using techBASIC 2.3, use the file `Analysis 2.3.bas` instead of the file `Analysis.bas`.
- From your iPhone or iPad, copy the contents of the email by tapping twice, then tapping **Select All**, then tapping **Copy**.
- Create a new program.
 - iPhone/iPod: From techBASIC's Programs tab, tap **New** to create a new program. Use the name `Analysis`.
 - iPad: Tap the **New** button at the bottom of the Programs list to create a new program.
- Paste the program into the newly created empty file by tapping the screen and then tapping the **Paste** button.

Step 3



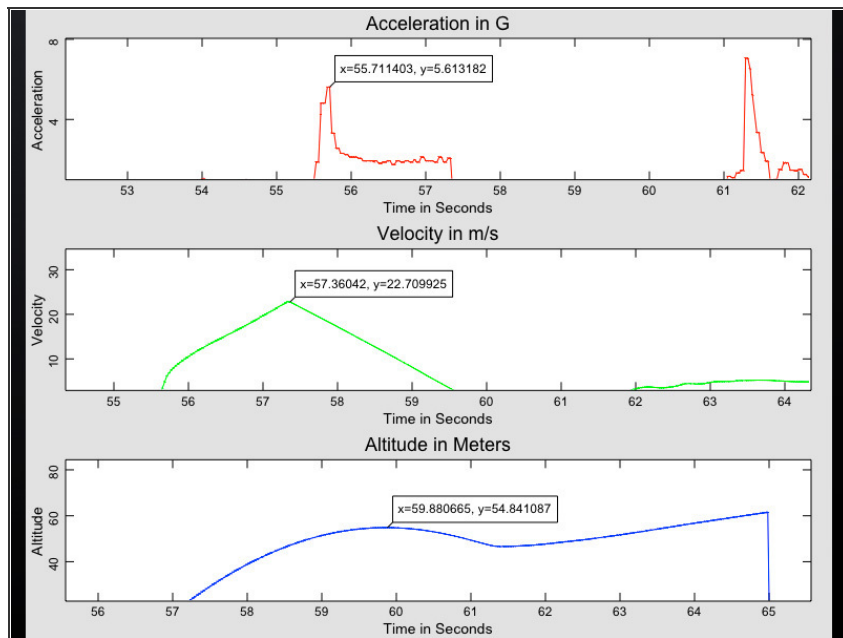
- Copy my data files to techBASIC to get started.
- Connect your iPhone or iPad to your computer.
- Run iTunes.
- Select your device from Devices.
- Select Apps from the top menu.
- Scroll down and select techBASIC.
- Drag the data files to the techBASIC Documents list:
`flight1.txt`, `flight1i.txt`,
`flight2.txt`, `flight2i.txt`,
`RocketDataCalibration.txt`.

Step 4



- The picker lets you select from any available rocket data. It is showing four data files from our rocket flights. Tap a different flight to see its data.
- The five buttons at the right let you show or hide the five available plots.
- Tap on a plot to see the numeric value at any specific point.

Step 5



- Slide the plots around, use pinch gestures to expand or shrink the plots, or tap to see specific values.
- Lift off was at about 55.5 seconds into the data.
- Maximum acceleration from the rocket engine was 5.6G, about 0.2 seconds after lift off.
- Maximum velocity was 22.7 meters/second (51 miles per hour), and occurred about 2 seconds after lift off.
- Maximum altitude was 54.8 meters (180 feet). This occurred after the rocket coasted for a couple of seconds.

Step 6

```
Carrier 11:11 AM 100%
Programs Source Console Graphics Run Find Undo Redo Share Help About

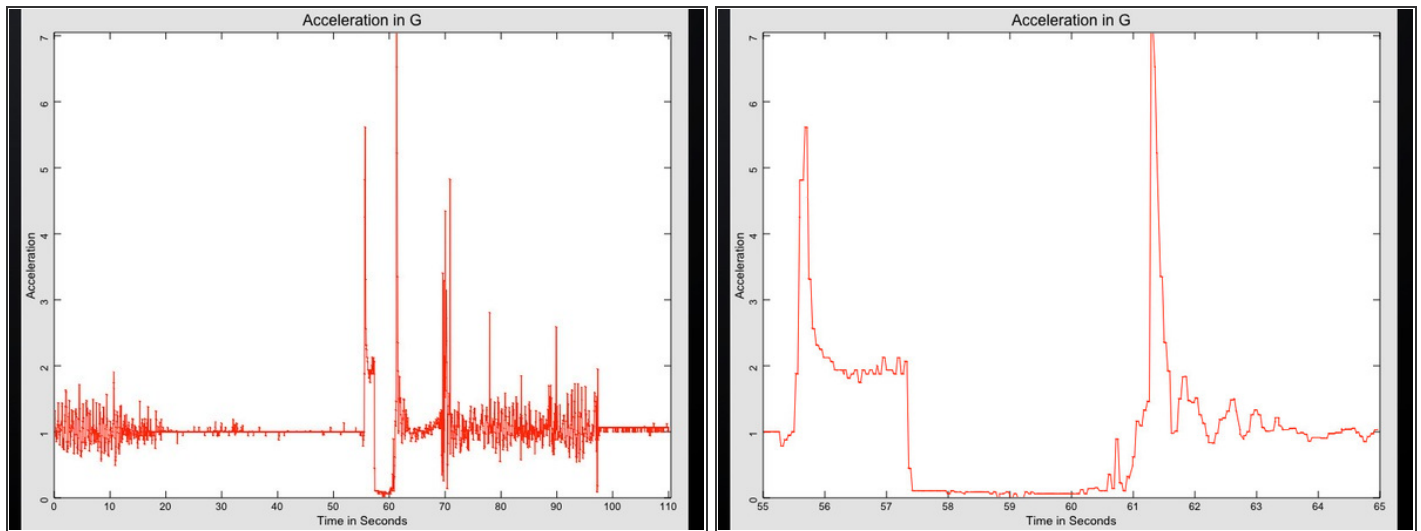
! Rocket Data Analysis
!
! This program analyzes data from rocket flights recorded with the Rocket Data
! program. That program records acceleration, rotation and barometric pressure
! during a rocket flight.
!
! Created at the Byte Works, Inc.
! Copyright 2012, All Rights Reserved
! support@byteworks.us
!
! Permission is grandet to use and modify this program for any noncommercial use so
! long as the above copyright notice is not removed.

● Create the list of files we can display and process.
count = 4
DIM files$(count), flightT0(count), flightT1(count), calibT0(count), calibT1(count)
files$(1) = "flight1i.txt"
files$(2) = "flight2i.txt"
files$(3) = "flight1.txt"
files$(4) = "flight2.txt"
flightIndex = 1
calibFile$ = "RocketDataCalibration.txt"

! Define globals.
DIM accelPlot AS Plot, accelPlotPoint AS PlotPoint, accelPoints(2, 2)
DIM velPlot AS Plot, velPlotPoint AS PlotPoint, velPoints(2, 2)
DIM distPlot AS Plot, distPlotPoint AS PlotPoint, distPoints(2, 2)
DIM gyroPlot AS Plot, gyroXPlotPoint AS PlotPoint, gyroXPoints(2, 2), gyroYPlotPoint
AS PlotPoint, gyroYPoints(2, 2), gyroZPlotPoint AS PlotPoint, gyroZPoints(2, 2)
DIM isVisible(201 TO 205) AS INTEGER
DIM baroPlot AS Plot, baroPlotPoint AS PlotPoint, baroPoints(2, 2)
```

- Edit these lines near the start of the program to add your own data.
- Change the value of count to the number of data files the program will list.
- Add any new files by adding another line to set a value in the files\$ array. Increment the number in parenthesis by one for each new file. Remember that file names are case-sensitive in iOS.

Step 7



- The raw data will have a lot of extraneous information, as well as some valuable calibration information.
- Find the start and end of the rocket flight. Enter the times in the Flight time fields. The plot will expand to show just the rocket flight.
- Improve the accuracy by calibrating the device.
 - Sitting on the pad, the accelerometer should measure 1G.
 - Select about 10 seconds of data before the launch. Enter the times in the Calibration time fields to mathematically calibrate the sensor to 1G.

Step 8

Collect Data from an iPhone Rocket Flight

Wednesday, October 31, 2012

It was a beautiful fall morning as I carefully packed the parachute, slid in the engine, and installed the igniter in my model rocket. I started the data collection program and slid the payload with a...

[Read more...](#)

Controlling the TI SensorTag with techBASIC

Wednesday, October 31, 2012

The Internet of Things has a new addition, and it's a great way to learn more about Bluetooth low energy. Most Bluetooth low energy devices are designed for a very specific use, but the new SensorTag...


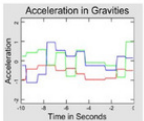


[Read more...](#)

Accessing the Bluetooth low energy Accelerometer on the TI SensorTag

Wednesday, October 31, 2012

Bluetooth low energy offers a great way for iPhone and iPad apps to connect to external devices. Bluetooth low energy is free of the shackles imposed by Apple's MFi program, so anyone can write apps...

[Read more...](#)



- There's a story behind the data, as well as some important caveats about errors. See the Rocket Data Analysis portion of [this blog](#) if you would like to learn more about how the calculations are done and how reliable they are.
- See [this blog](#) if you would like to learn more about creating user interfaces in techBASIC. This is what you need to know to modify the controls you see in the program.
- See [this blog](#) to learn more about using plots and graphics in techBASIC. This tells you how to change and create plots like the five used in this program.
- See [this blog](#) to explore how data is actually collected from Bluetooth low energy devices like the Texas Instruments SensorTag.

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